

Appendix B - 2

Long Haul Rail

Long-Haul Railway Activities

Railway/control center operations. The control center monitors the railroad system and advises train and station operators and dispatchers. It controls system integrity.

Station and depot operations. Operations at and in the vicinity of stations, involving tracks, rolling stock, and platforms.

Hump yard operations. Includes maintenance, inspections, and local operations.

Construction. Includes scheduling, maintenance, and repair activities.

Hazardous material. Includes monitoring the transport and handling of materials, as well as mitigation, reclamation, and reporting of events or incidents.

Surveillance. Includes inspections, monitoring, and maintenance of trackage, supporting structure, and facilities.

Personnel safety. Safety of train crews, station and depot personnel, and passengers.

Weather Needs for Long-Haul Railway Transportation

Weather Element	Threshold	Activity	Impacts	Action	Lead Time
Freezing Precipitation (ice, inches)	Any	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Reduced ability of employees to get to work, impeded/restricted foot traffic and road use by inspection crews, transportation platform safety (clearing ice off platform, passenger safety boarding and leaving train), train speed reductions with attendant delays, possible switch failure, possible malfunction of track sensors and signal sensors, possible signal malfunction, rail inspection crews may be required, signal maintenance crew may be required, potential increase in ridership (Passenger service increases because other modes are not available.)	Advise and update dispatch centers, crews, and stations. Predict affected areas, review and prepare treatment options. Initiate ice/snow plan, choose applicable chemical treatment, if warranted. Modify operations to forecast conditions. Plan for reroute if feasible, plan for slowing or stopping, consider delayed departures. Inspect tracks, repair as necessary. Distribute advisories and updates regarding weather situation and track conditions. Prepare to initiate crew recall or re-crew notification.	24 hours
			Reduced ability of employees to get to work, impeded/restricted foot traffic and road use by inspection crews, transportation platform safety (clearing ice off platform, passenger safety boarding and leaving train), train speed reductions with attendant delays, possible switch failure, possible malfunction of track sensors and signal sensors, possible signal malfunction, rail inspection crews may be required, signal maintenance crew may be required, potential increase in ridership (Passenger service increases because other modes are not available.), increased attention to hazardous material (monitoring, mitigation, reclamation, reporting)	Warn and update dispatch centers, crews, and stations. Predict affected areas, prepare treatment options, initiate and execute ice/snow plan, apply chemical treatment if warranted. Modify operations for conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect tracks, repair as necessary. Publish and distribute advisories and updates warning of weather situation and track conditions. Initiate crew recall and re-crew notification. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	6 hours
Frozen Precipitation (snow, inches)	Any	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Reduced ability of employees to get to work, impeded/restricted foot traffic and road use by inspection crews, transportation platform safety (clearing snow off platform, passenger safety boarding and leaving train), train speed reductions with attendant delays, possible switch failure, possible malfunction of track sensors and signal sensors, possible signal malfunction, rail inspection crews may be required, signal maintenance crew may be required, potential increase in ridership (Passenger service increases because other modes are not available.)	Advise, warn, and update dispatch centers, crews, and stations. Predict affected areas, review and prepare treatment options, initiate ice/snow plan, apply chemical treatment if warranted. Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect tracks, repair as necessary. Publish and distribute advisories and updates warning of weather situation and track conditions. Make preparations for or initiate crew recall or re-crew notification.	24 hours
Frozen Precipitation (snow, inches)	≥2 and <6 inches	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Reduced ability of employees to get to work, impeded/restricted foot traffic and road use by inspection crews, transportation platform safety (clearing snow off platform, passenger safety boarding and leaving train), possible malfunction of track sensors or signal sensors, possible signal malfunctions, rail inspection crews may be required, signal maintenance crew may be required	Advise and update dispatch centers, crews, and stations. Predict affected areas, review and prepare treatment options, review ice/snow plan (if warranted), apply chemical treatment if warranted. Review procedures for the conditions present or forecast. Distribute advisories and updates warning of weather situation and track conditions. Review crew recall plan.	24 hours
			Reduced ability of employees to get to work, impeded/restricted foot traffic and road use by inspection crews, transportation platform safety (clearing snow off platform, passenger safety boarding and leaving train), possible malfunction of track sensors or signal sensors, possible signal malfunctions, rail inspection crews may be required, signal maintenance crew may be required, increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Advise and update dispatch centers, crews, and stations. Predict affected areas, implement treatment options, review and initiate ice/snow plan (if warranted), apply chemical treatment as appropriate. Review procedures for current or forecast conditions. Distribute advisories and updates warning of weather situation and track conditions. Initiate crew and re-crew recall plan. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	6 hours

Weather Needs for Long-Haul Railway Transportation

Weather Element	Threshold	Activity	Impacts	Action	Lead Time
Frozen Precipitation (snow, inches)	≥6 and <8 inches	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Restricted ability of employees to get to work, impeded/restricted foot traffic and road use by inspection crews, transportation platform safety (clearing snow off platform, passenger safety boarding and leaving train), train speed reductions with attendant delays, possible switch failure, probable malfunctions of track sensors and signal sensors, probable signal malfunction, rail inspection crews may be required, signal maintenance crew may be required, increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting), potential increase in ridership (Passenger service increases because roadway mode may not be viable.)	Advise and update dispatch centers, crews, and stations. Predict affected areas, implement treatment options, execute ice/snow plan, apply chemical treatment as appropriate. Review and modify operations to conditions present or forecast. Inspect tracks. Publish and distribute advisories, warnings, and updates regarding weather situation and track conditions. Prepare for crew recall and/or re-crew notification/recall.	24 hours
			Restricted ability of employees to get to work, impeded/restricted foot traffic and road use by inspection crews, transportation platform safety (clearing snow off platform, passenger safety boarding and leaving train), train speed reductions with attendant delays, possible switch failure, probable malfunctions of track sensors and signal sensors, probable signal malfunction, rail inspection crews may be required, signal maintenance crew may be required, increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting), potential increase in ridership (Passenger service increases because roadway mode may not be viable.)	Warn and update dispatch centers, crews, and stations. Outline affected areas, prepare and implement treatment options, initiate ice/snow plan, apply chemical treatment as appropriate. Prepare for and initiate crew recall, re-crew notification/recall. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	6 hours
Frozen Precipitation (snow, inches)	≥8	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Restricted ability of employees to get to work, impeded/restricted foot traffic and road use by inspection crews, transportation platform safety (clearing snow off platform, passenger safety when boarding and leaving train), train speed reductions with attendant delays, switch failure likely, malfunctions of track sensors or signal sensors likely, signal malfunction likely, rail inspection crews may be required, signal maintenance crew may be required, potential increase in ridership (Passenger service increases because other modes are not available.)	Advise, warn, and update dispatch centers, crews, and stations. Predict affected areas, prepare treatment options, execute ice/snow plan, apply chemical treatment if warranted. Review and modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect tracks and repair as necessary. Distribute advisories, warnings, and updates regarding weather situation and track conditions. Initiate and execute crew recall, re-crew notification.	24 hours
			Restricted ability of employees to get to work, impeded/restricted foot traffic and road use by inspection crews, transportation platform safety (clearing snow off platform, passenger safety when boarding and leaving train), train speed reductions with attendant delays, switch failure likely, malfunctions of track sensors or signal sensors likely, signal malfunction likely, rail inspection crews may be required, signal maintenance crew may be required, potential increase in ridership (Passenger service increases because other modes are not available.), increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Advise, warn, and update dispatch centers, crews, and stations. Outline affected areas, review and initiate treatment options, execute ice/snow plan, apply chemical treatment as appropriate. Review and modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect tracks and repair as necessary. Distribute advisories and updates warning of weather situation and track conditions. Initiate/execute crew recall and re-crew notification/recall. If HAZMAT spill occurs, initiate reaction/mitigation plan.	6 hours
Drifting Snow (inches)	≥8	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Reduced ability of employees to get to work, impeded/restricted foot traffic and road use by inspection crews, transportation platform safety (clearing snow off platform, passenger safety boarding and leaving train), train speed reductions with attendant delays, possible switch failure, possible malfunction of track sensors and signal sensors, possible signal malfunction, rail inspection crews may be required, signal maintenance crew may be required, potential increase in ridership (Passenger service increases because other modes are not available.)	Advise, warn, and update dispatch centers, crews, and stations. Predict affected areas, prepare treatment options, execute ice/snow plan, apply chemical treatment if warranted. Review and modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect tracks and repair as necessary. Publish and distribute advisories and updates warning of weather situation and track conditions.	24 hours

Weather Needs for Long-Haul Railway Transportation					
Weather Element	Threshold	Activity	Impacts	Action	Lead Time
			Reduced ability of employees to get to work, impeded/restricted foot traffic and road use by inspection crews, transportation platform safety (clearing snow off platform, passenger safety boarding and leaving train), train speed reductions with attendant delays, possible switch failure, possible malfunction of track sensors and signal sensors, possible signal malfunction, rail inspection crews may be required, signal maintenance crew may be required, potential increase in ridership (Passenger service increases because other modes are not available.), increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Advise, warn, and update dispatch centers, crews, and stations. Identify affected areas, initiate treatment options, execute ice/snow plan, apply chemical treatment, as appropriate. Review and modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Publish and distribute advisories and updates warning of weather situation and track conditions. Initiate/execute crew recall, re-crew notification/recall. Inspect tracks and repair as necessary. If HAZMAT spill occurs, initiate reaction/mitigation plan.	6 hours
Liquid Precipitation	Heavy	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Reduced ability of employees to get to work; possible train speed reductions with attendant delays; possible malfunctions of track sensors or signal sensors; possible wash-outs, slides, or high water impacts; potential signal malfunctions; rail inspection crews may be required; signal maintenance crew may be required; possible missed signals due to reduced visibility in heavy rain; increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Advise, warn, and update dispatch centers, crews, and stations. Identify affected areas, stage equipment and inspection teams. Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect tracks and repair as necessary. Distribute warnings and updates regarding the weather situation and track conditions. Review and initiate crew recall, re-crew notification/recall. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	6 hours
Flooding	Any	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Reduced ability of employees to get to work; possible train speed reductions with attendant delays; possible malfunctions of track sensors or signal sensors; possible wash-outs, slides, or high water impacts; potential signal malfunctions; rail inspection crews may be required; signal maintenance crew may be required; possible missed signals due to reduced visibility in heavy rain	Advise, warn, and update dispatch centers, crews, and stations. Predict affected areas, outline affected areas for pre-staging of equipment and inspection crews. Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect tracks and repair as necessary. Distribute advisories and updates warning of weather situation and track conditions. Review and initiate crew recall, re-crew notification/recall.	24 hours
			Reduced ability of employees to get to work; possible train speed reductions with attendant delays; possible malfunctions of track sensors or signal sensors; possible wash-outs, slides, or high water impacts; potential signal malfunctions; rail inspection crews may be required; signal maintenance crew may be required; possible missed signals due to reduced visibility in heavy rain; increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Advise, warn, and update dispatch centers, crews, and stations. Outline affected areas, stage response teams and equipment. Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect tracks and repair as necessary. Distribute advisories and updates warning of weather situation and track conditions. Initiate/execute crew recall, re-crew notification/recall. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	12 hours
Thunderstorms with Wind, Lightning, or Hail (hail size, proximity to route or operational area in miles)	>1/4 inch, ≤5 miles	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Refueling operations delayed, track signal sensor malfunction resulting in possible train delays and stops, crew safety (delay or suspend operations), increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Advise, warn, and update dispatch centers, crews, and stations. Predict/define affected areas. Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect tracks, track sensors, and signals. Publish and distribute advisories and updates warning of weather situation and track conditions. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	12 hours
			Refueling operations delayed, track signal sensor malfunction resulting in possible train delays and stops, crew safety (delay or suspend operations), increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Warn and update dispatch centers, crews, and stations. Define affected areas. Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect and repair tracks, track sensors, and signals. Distribute warnings and updates regarding weather situation and track conditions. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	30 minutes

Weather Needs for Long-Haul Railway Transportation					
Weather Element	Threshold	Activity	Impacts	Action	Lead Time
Thunderstorms with Tornadoes (proximity to route or operational area in miles)	≤5 miles	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Reduced ability of employees to get to work, possible train speed reductions with attendant delays, possible malfunctions of track sensors and signals, possible damage to track and/or signals, rail inspection crews may be required, signal maintenance crew may be required, crew, personnel and passenger safety, increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Advise, warn, and update dispatch centers, crews, and stations. Predict/define affected areas. Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect tracks, track sensors, and signals. Publish and distribute advisories and updates warning of weather situation and track conditions. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	12 hours
			Reduced ability of employees to get to work, possible train speed reductions with attendant delays, possible malfunctions of track sensors and signals, possible damage to track and/or signals, rail inspection crews may be required, signal maintenance crew may be required, crew, personnel and passenger safety, increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Warn and update dispatch centers, crews, and stations. Define affected areas. Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect and repair tracks, track sensors, and signals. Distribute warnings and updates regarding weather situation and track conditions. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	30 minutes
Air Temperature (degrees F, first occurrence of season)	≤32°	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	increased rail contraction and rail warning signals (The first time each season that the air temperature drops to or below 32° F causes occurrence of track warning signals and potential for derailment.); possible malfunction of track sensors and signals; possible track and/or signal damage; rail inspection crews may be required; signal maintenance crew may be required; crew, personnel, and passenger safety	Advise, warn, and update dispatch centers, crews, and stations. Predict affected areas, pre-stage resources (equipment and crews). Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Review maintenance records to determine areas susceptible to track motion. Inspect and repair tracks, track sensors, and signals as needed. Distribute advisories, warnings, and updates regarding weather situation and track conditions.	3 days
			Increased rail contraction (The first time each cold season that the air temperature drops to or below 32o F causes rail contractions with increased occurrence of track warning signals and potential for derailment.); possible malfunction of track sensors and signals; possible track and/or signal damage; rail inspection crews may be required; signal maintenance crew may be required; crew, personnel, and passenger safety; increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Warn and update dispatch centers, crews, and stations. Define affected areas, stage resources (equipment and crews). Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect and repair tracks, track sensors, and signals. Distribute advisories, warnings, and updates regarding the weather situation and track conditions. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	12 hours
Air Temperature (degrees F, first occurrence of season)	>70°-75°	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Increased rail expansion (The first time each warm season that the air temperature rises to or above 70-75° F, rail expansion causes increased numbers of track warning signals and potential for derailment.); possible malfunction of track sensors and signal sensors; possible track and/or signal damage; rail inspection crews may be required; signal maintenance crew may be required; crew, personnel, and passenger safety.	Advise, warn, and update dispatch centers, crews, and stations. Predict affected areas, pre-stage resources (equipment and crews). Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Review maintenance records to determine areas susceptible to track motion. Inspect and repair tracks, track sensors, and signals as needed. Distribute advisories, warnings, and updates regarding weather situation and track conditions.	3 days
			Increased rail expansion (The first time each warm season that the air temperature rises to or above 70-75° F, rail expansion causes increased numbers of track warning signals and potential for derailment.); possible malfunction of track sensors and signal sensors; possible track and/or signal damage; rail inspection crews may be required; signal maintenance crew may be required; crew, personnel, and passenger safety; increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Warn and update dispatch centers, crews, and stations. Define affected areas, stage resources (equipment and crews). Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect and repair tracks, track sensors, and signals. Distribute advisories, warnings, and updates regarding the weather situation and track conditions. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	12 hours

Weather Needs for Long-Haul Railway Transportation					
Weather Element	Threshold	Activity	Impacts	Action	Lead Time
Air Temperature (degrees F)	≤0°	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Continued risk of track contraction, potential for derailment, possible malfunction of track sensors and signal sensors, possible track and/or signal damage, rail inspection crews may be required, signal maintenance crew may be required, health and safety risks (hypothermia, frost bite likely)	Advise, warn, and update dispatch centers, crews, and stations. Predict affected areas, pre-stage resources (equipment and crews). Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Review maintenance records to determine areas susceptible to track motion. Inspect and repair tracks, track sensors, and signals as needed. Distribute advisories, warnings, and updates regarding weather situation and track conditions.	24 hours
			Continued risk of track contraction, potential for derailment, possible malfunction of track sensors and signal sensors, possible track and/or signal damage, rail inspection crews may be required, signal maintenance crew may be required, health and safety risks (hypothermia, frost bite likely), increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Warn and update dispatch centers, crews, and stations. Define affected areas, stage resources (equipment and crews). Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect and repair tracks, track sensors, and signals. Distribute advisories, warnings, and updates regarding the weather situation and track conditions. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	12 hours
Air Temperature (degrees F)	≥90°	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Continued risk of track expansion potential for derailment, possible malfunction of track sensors and signal sensors, possible track and/or signal damage, rail inspection crews may be required, signal maintenance crew may be required, health and safety risks (heat exhaustion likely)	Advise, warn, and update dispatch centers, crews, and stations. Predict affected areas, pre-stage resources (equipment and crews). Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Review maintenance records to determine areas susceptible to track motion. Inspect and repair tracks, track sensors, and signals as needed. Distribute advisories, warnings, and updates regarding weather situation and track conditions.	24 hours
			Continued risk of track expansion potential for derailment, possible malfunction of track sensors and signal sensors, possible track and/or signal damage, rail inspection crews may be required, signal maintenance crew may be required, health and safety risks (heat exhaustion likely), increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Warn and update dispatch centers, crews, and stations. Define affected areas, stage resources (equipment and crews). Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect and repair tracks, track sensors, and signals. Distribute advisories, warnings, and updates regarding the weather situation and track conditions. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	12 hours
Rail Temperature (degrees F)	≤32° with moisture	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Safety and damage risks (Continued risk of track contraction exists when rail temperature drops to or less than 32 ° F.), potential for derailment, possible malfunction of track sensors and signal sensors, possible track and/or signal damage, rail inspection crews may be required, signal maintenance crew may be required, health and safety risks (hypothermia, frost bite possible)	Advise and update dispatch centers, crews, and stations. Predict affected areas, pre-stage resources (equipment and crews). Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Review maintenance records to determine areas susceptible to track motion. Distribute advisories and updates regarding weather situation and track conditions.	24 hours
			Safety and damage risks (Continued risk of track contraction exists when rail temperature drops to or less than 32 ° F.), potential for derailment, possible malfunction of track sensors and signal sensors, possible track and/or signal damage; rail inspection crews may be required, signal maintenance crew may be required, health and safety risks (hypothermia, frost bite possible)	Advise, warn, and update dispatch centers, crews, and stations. Predict affected areas, pre-stage resources (equipment and crews). Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Review maintenance records to determine areas susceptible to track motion. Distribute advisories, warnings, and updates regarding weather situation and track conditions.	12 hours
Rail Temperature (degrees F)	≥110°	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Continued risk of track expansion when rail temperature rises to or above 110° F (~20° to 30° F above the neutral installation temperature); potential for derailment; possible malfunction of track sensors and signal sensors; possible track and/or signal damage; rail inspection crews may be required; signal maintenance crew may be required; crew, personnel, and passenger safety	Advise, warn, and update dispatch centers, crews, and stations. Predict affected areas, pre-stage resources (equipment and crews). Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Review maintenance records to determine areas susceptible to track motion. Inspect and repair tracks, track sensors, and signals as needed. Distribute advisories, warnings, and updates regarding weather situation and track conditions.	2-3 days
			Continued risk of track expansion when rail temperature rises to or above 110° F (~20° to 30° F above the neutral installation temperature); potential for derailment; possible malfunction of track sensors and signal sensors; possible track and/or signal damage; rail inspection crews may be required; crew, personnel, and passenger safety; increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Warn and update dispatch centers, crews, and stations. Define affected areas, stage resources (equipment and crews). Modify operations for current or forecast conditions. Slow or stop trains, reroute if feasible, delay departure from station. Inspect and repair tracks, track sensors, and signals. Distribute advisories, warnings, and updates regarding the weather situation and track conditions. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	12 hours

Weather Needs for Long-Haul Railway Transportation

Weather Element	Threshold	Activity	Impacts	Action	Lead Time
Soil Temperature, Freezing or Thawing Trend (degrees F)	Decreasing to <32° or increasing to >32°	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Risk of railbed motion/movement from ground heave (Ground heave is most prevalent during autumn freezes and spring thaws.), construction and inspection delays likely, possible failure of track and railbed; possible derailment; increased risk of HAZMAT incidents, public relations effects	Issue advisories to rail management and operators. Consider increasing rail remote sensing interval or physical inspection. Schedule additional system monitoring queries, assign additional crews/re-crews as required. Initiate alternative construction/maintenance work schedule. Ensure personnel have proper clothing and footwear for snow and ice. Consider the effects of topography and failure location for remediation and reclamation. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	6 hours
Wind Chill (degrees F)	≤ -20°	Construction: scheduling, maintenance, repair. Personnel Safety Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center.	Crew, personnel, and passenger safety (hypothermia, frost bite); potential operational delays.	Advise operators, monitor personnel, modify or restrict operations. Plan to increase available manpower. Insist that crews are clothed appropriately for cold weather and ensure that other cold weather gear is available.	24 hours
			Crew, personnel, and passenger safety (hypothermia, frost bite); potential operational delays.	Advise operators, monitor personnel, modify or restrict operations. Limit personnel time outside, increase available manpower. Insist that crews are clothed appropriately for cold weather.	12 hours
Heat Index (degrees F)	≥ 105°	Construction: scheduling, maintenance, repair. Personnel Safety Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center.	Safety and health risk (heat exhaustion), potential operational delays	Advise operators, break shifts, restrict or suspend operations. Plan to increase available manpower, insist that crews are clothed appropriately for hot weather.	24 hours
			Safety and health risk (heat exhaustion), potential operational delays	Advise operators, break shifts, restrict or suspend operations. Limit personnel time outside, increase available manpower. Insist that crews are clothed appropriately for hot weather.	12 hours

Weather Needs for Long-Haul Railway Transportation					
Weather Element	Threshold	Activity	Impacts	Action	Lead Time
Visibility, including Restriction (statute miles)	≤1 mile, <1/2 mile	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Crew, personnel and passenger safety risks; missed signals, obstructions on track, etc.; increasing risks of collisions and derailments; reduced speed; delays in service; increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Advise operators, reduce speeds or stop trains, modify operations. If HAZMAT incident occurs, initiate spill reaction/mitigation plan.	12 hours
			Crew, personnel and passenger safety risks; missed signals, obstructions on track, etc.; increasing risks of collisions and derailments; reduced speed; delays in service; increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Advise operators, reduce speeds or stop trains, modify operations. If HAZMAT incident occurs, initiate spill reaction/mitigation plan.	6 hours
Wind: Head, Cross, or Tail (wind speed in miles per hour)	≥50 mph	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Crew, personnel, and passenger safety risks; damage risk; rail car blow over likely; schedule delays; possible track and/or signal damage; rail inspection crews may be required; signal maintenance crew may be required; increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Advise operators/operations, review options, restrict or suspend operations. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	12 hours
			Crew, personnel, and passenger safety risks; damage risk; rail car blow over likely; schedule delays; possible track and/or signal damage; rail inspection crews may be required; signal maintenance crew may be required; increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Advise operators/operations, review options, restrict or suspend operations. If HAZMAT incident occurs, initiate spill reaction/mitigation plan.	1 hour
Hurricane: Winds, Sea State, Tidal Surge, Flooding	Any	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Safety risks to personnel and equipment (possible injury or death from accidents); railway roadbed scoured, buried, damaged or destroyed; rail damage from line stretch and foreign debris impact; winds, seas, tides may restrict or suspend coastal rail traffic; rail sensor failure likely; possible railbed or track failures and derailments; increased monitoring of crews and equipment required; increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting); potential for disrupted construction or maintenance cycles; public relations effects	Acquire hurricane advisories and/or warnings. Issue advisories and/or warnings to rail management and operators. Increase the number of visual inspections and rail remote monitoring efforts. Increase rail surveillance; check for bridge, trestles, railbed integrity. Consider the effects of topography and failure location for remediation and reclamation. Assign additional crews/re-crews, as required. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan. Ensure proper authorities are notified. Restrict or suspend rail operations. Reschedule, restrict, or suspend aerial and vehicle track inspections based on weather safety. Initiate alternate construction/maintenance work schedule. Ensure proper clothing and footwear are worn by crews for slick and flooded walkways and road surfaces.	12-24 hours
Earthquake: Land Motion, Landslides, Avalanches, Etc.	Any	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Safety risks to personnel and equipment (accidents are likely with possible injury or death); railway roadbed scoured, buried, damaged or destroyed; rail damage from line stretch and foreign debris impact likely; rail sensor failure likely; increased monitoring of crews and equipment; increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting); public relations effects	Issue advisories to rail management and operators. Increase the number of visual inspections and rail remote monitoring efforts. Consider the effects of topography and derailment location for remediation and reclamation. Schedule additional system monitoring queries, assign additional crews/re-crews, as required. Initiate fuel management contingency plans (re-route, store, cancel transfers, etc) based on impact of land motion. If HAZMAT incident occurs, initiate HAZMAT spill reaction/mitigation plan.	12-24 hours and current observation

Weather Needs for Long-Haul Railway Transportation

<u>Weather Element</u>	<u>Threshold</u>	<u>Activity</u>	<u>Impacts</u>	<u>Action</u>	<u>Lead Time</u>
Nuclear, Biological or Chemical Release	Any	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	Safety risks to personnel and equipment; increased monitoring of crews and equipment (During a rail failure, vapors and toxins are released to the environment with possible/likely catastrophic results. Accidents are likely with possible injury or death.)	Acquire output from atmospheric transport & diffusion model depicting the horizontal and vertical distribution of the toxin or vapor. Issue advisories and/or warnings to rail management and operators. Initiate/execute HAZMAT spill reaction/mitigation plan. Ensure proper authorities are notified.	1-3 hours and current observation
Space Weather (solar flares etc.)	Any	Railway/Control Center Operations: monitor, advise, control system integrity. Station & Depot Operations: monitor local operations, advise Control Center. Hump Yard Operations: maintenance, inspections, local operations, advise Control Center. Construction: scheduling, maintenance, repair. Hazardous Material: monitoring, mitigation, reclamation, reporting. Surveillance: inspections, monitoring, maintenance. Personnel Safety	GPS navigation disrupted, radio/cellular phone communications disrupted, increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Advise operators, monitor communication interruptions. Prepare for alternate communications methods.	2-3 days
			GPS navigation disrupted, radio/cellular phone communications disrupted, increased risk of hazardous material spill (increased monitoring, mitigation, reclamation, reporting)	Advise operators, monitor communication interruptions. Initiate alternate communications methods.	12 hours